Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

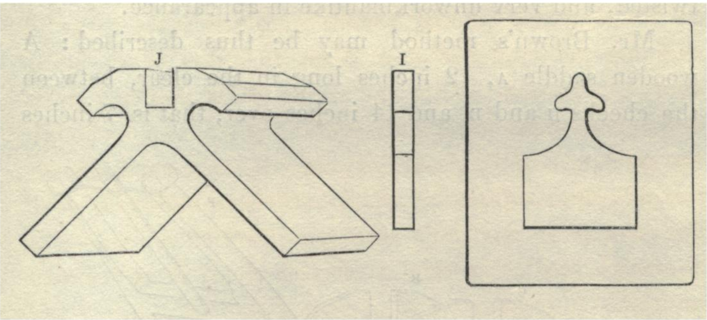
Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

side of the saddle, and a handle attached outside to the fixed cheeks, complete the contrivance; the groove in each of the cheeks C B is 1½ inch deep, and 1 inch wide.

When a grooved ridge-tile is to be made, the moulder entirely covers the saddle between the cheeks with clay, and then with a bow F F runs the wire E over the two cheeks, and the operation is completed; the movable cheek H is then taken off by removing a pin D running through two staples, and the perfect tile is slipped off ready to be put into the kiln.

The groove being thus formed in the ridge-tile, any kind of ornament may be inserted therein, and secured thereto by cement. The price of the grooved ridge-tile is at the rate of one shilling per linear foot.



No. IV.

IMPROVED LEVER-MICROSCOPE.

The Gold Isis Medal was presented to Mr. Cornelius Varley, of No. 1 Charles Street, Clarendon Square, for his improved Lever-Microscope.

Having made several contrivances to improve the microscope so as to facilitate its use, several of which have been favourably received and acknowledged by medals and thanks from the Society, I still had not obtained the full extent of my wish, until I invented the present instrument. The objects which I aimed at, and which I believe I have attained, are,

First, a very strong and durable microscope, that will pack into a small compass, and yet require the least possible taking to pieces for that purpose.

Secondly, the construction is such that it may receive all kinds of objects with different modes of illumination.

Thirdly, the capability of examining living objects, whether animal or vegetable, from the ease with which they may be kept in view for any period, or be followed through every course of their motions, and this I effect by a very satisfactory movement of the stage by a single lever.

Fourthly, its holding a phial quite vertically, so as to examine the contents from time to time, there being many microscopic plants and animalcules that will grow and adhere to the inner surface of the phial; and, although the curvature of the phial is an imperfection, yet it affords the only means of continued or successive observations of the growth of such objects, many of which are liable to be shaken off if the phial is turned about in an inclined position.

Fifthly, the ready means of tracing the images of all kinds of objects, whether magnified much or little, and thereby obtaining really correct portraits of the objects at the expense of much less time and trouble than could possibly be done by the ordinary mode.

Plate 2 is a perspective view of the microscope, ready for viewing transparent or opaque objects; it is one-third the real size.

Plate 3 represents the microscope mounted on a stool ready for tracing the magnified images of any object.

Figures 2 and 3 represent the phial-holder; these are one-quarter the real size.

Plates 1 and 4 contain the details of its structure, half the real size, the same letters of reference serving for all the figures.

Mounting of the Microscope.

Plate 2, the top of the pillar ends in a thick flat disk of brass *a a*, it is turned flat on both sides with a central hole, to this the microscope is joined by means of the strong block *b*, whose face is turned to fit against it, with a central screw to pass through the hole, and, receiving a squared collet, be fastened by the screw-nut *c*. The top and bottom of the block are made larger than the middle that they may be bored through to receive the long rod *d*, against which, in the middle space, a saddle is placed for the screw *e* to bind it fast at any height. The back *g* of the stage-bed *f* is not in one piece with the block *b*, but is screwed to it for the convenience of working.

In plate 4, fig. 4 is a side view of the stage *h* on its bed *f g*, and the block *b* without the pillar shewing the face of the joint and its central screw *c*. Plate 1, fig. 5, represents a front view of the block alone, with the stage and bed, fig. 6, placed above it; here are seen the four holes by which the stage-bed is screwed on, and the cavity in which the saddle is placed to be pressed against the rod by the screw *e*, and to the side *j* is to be screwed a plate which will spring hard enough against the rod to hold it up when the screw *e* is loosened.

The stage-bed *f* and its portion *g* are formed at right angles, the part *g* being screwed to the block, and the whole is rendered very firm by the braces *i i*, figs. 4, 7, and 8. Fig. 7 is an under view of the whole stage, and fig. 8 of the bed alone. The stage *h* is a flat plate laid on the bed *f*, on which it can slide freely in any direction, it having three hooks *k*, *l*, *l*, screwed to it so as to hold both together. In order to make room for the lateral motion of the hooks, the stage-bed is cut out, as at *m m* and *n n*, fig. 8; it will be seen in fig. 7 that the hooks *k* and *l l* being screwed to the movable plate *h*, with their ends just coinciding with its aperture, they will occasionally pass over the margin of the central hole, in the fixed bed *f*, and so prevent any thing being screwed into it. In order, therefore, to recover the use of this hole, a substitute is provided by a screwed ring *o* of the same size standing on three feet, which is screwed to the bed so as to afford room for the hooks to pass under, its aperture remaining clear to receive any fittings.

Stage Movement.

To give lateral motion to the stage, a lever is adapted to it, to hold which a fulcrum *p* is held out from the bed by three arms *q*, *q*, and *r*, this fulcrum holds the larger ball of the lever *s*; then, to the movable stage (figs. 6 and 7) is joined a small socket *t* to receive the upper ball of the lever, the cap of this socket *t* has a gap, as shewn in the separate figure, to allow its being put on the lever. The lever *s* descends sufficiently near to the table to enable the hand whilst resting thereon to pull or push it in any direction, and so move the stage the reduced quantity, which here is as 1 to 6. But this easy motion of the stage requires to be communicated to both sides of it simultaneously, and this is effected by the addition of a

Parallel Motion,

Which apparatus causes the motion that is given at one side to act also on the other. Figs. 4, 6, and 7, shew the mode of applying it; the thick parts of the hooks *l l* are perforated to receive the end arms of the swinging bar *u u*, steel pins passed through form the joints, thus the bar swings pendant from the upper plate *h*, the under side of the bar *u* has sockets with caps *v v*, from which two parallel rods *w w* proceed to the sockets *x x* made under the front of the stage-bed, by these the two plates are held quite parallel to each other, but with the same freedom of moving laterally as before by motion of the lever. Whichever way the balls and sockets move the friction is the same, and the friction of the swing-bar on its pins is too slight to be appreciated, so that the hand is not sensible of any difference while moving the stage in any direction; an observer, therefore, may follow the motion of any living object, or the motions of particles circulating in the cells of plants, keeping them constantly in view, with scarcely any consciousness of what his hand is doing; thus his attention to the object is not disturbed.

The three hooks do not spring against the stage-bed, but are in preference faced with cloth, which allows of sufficient ease and smoothness of motion.

In plate 2 is shewn a sliding plate *y*, and in fig. 6 the two dovetails that receive it, and in plate 3 is shewn one of the finger springs which fit like tweezers on the projecting portion of the slide *y*. In fig. 5, *z* is the portion of the block on which the tube *z* is soldered. At the bottom of the lever *s* is a brass ball just heavy enough to balance the weight of the stage whenever the microscope is inclined.

The rod *d* is made long to allow of large objects being laid on the stage, and also to support the sketching eyepiece, as in plate 3.

Quick Adjustment by Rack and Pinion.

In fig. 4, 1, 1 is a section of the body; it is made to slide against the trough 2 2, as shewn by the dotted circle, fig. 9, it is held there by a sort of handle, made by the two saddle-pieces 3 3 and the bar 4; this bar has a long hole, as shewn in the separate view, fig. 10, a spring lays over this loop-hole, and the screw 5 passes through and binds it enough to slide up and down with the due degree of friction. The rack 6 is soldered to the tube. The pinion is held in a spring made of plate-brass as wide as the trough, it is turned up, as shewn separately in fig. 11, and has four feet to stand against the bar without touching the spring-collet; the dotted lines in fig. 10 shew the position of these feet. The back of this spring has a hole fitting on to the screw-head 5, and, the pinion being held exactly opposite to the hole, this single fitting gives all the hold that is requisite to keep the pinion in place. The milled heads which turn the pinion pass through holes in the sides of the trough, as shewn in fig. 9.

When putting together, the bar 4, with the spring-collet and screw 5, are first put in, as fig. 9; next the pinion-holder is put on the screw-head, as in fig. 4; then the pinion is passed into its place through one side of the trough, and the second milled head pinned on, the rack and body is then pressed close, and the two screws put in to bind the bar 4 to the saddles 3 3; then, by turning the pinion, the body will slide up or down against the trough. Two rings 7 7 project from the back of the trough, these are fitted on to the rod *d*, and between them is placed the bent strap 8 8, also fitted easy on the rod; then the milled head screw, which is seen within the strap, serves to draw the strap and trough together, and bind them firmly on the rod; a spring-collet is placed under the milled head to prevent the body from sliding down by its own weight, when the screw is loosened either to turn the body aside or change its position.

Slow Adjustment by Screw and Lever.

In fig. 4, 9 is a short tube on which the object-glasses are to be screwed; it is made to slide in a cylindrical case 10, and has a spiral spring placed within, the action of which causes the tube to be pushed out; the two opposite sides of the case are perforated to receive links, as fig. 12, their lower pins enter the tube 9, and the upper pins lie in gaps on the forked lever 11, the ends of which are held by screw-pins to the case as a fulcrum; thus the tube 9 is only held up against the action of the internal spring by the forked lever. Fig. 13 is a top view of this lever 11 and the case 10; the fork is entirely within the tube 1, 1, but the single arm 11 projects through an opening in its front, and rests on the screw 12; thus, by advancing the screw, the lever will be raised, and the tube 9 lifted at a very slow rate, and, on withdrawing the screw, the internal spring will push down the tube 9, and cause the lever to follow the screw; thus there is no loss of motion, the least turn of the screw being answered by raising or lowering the object-glass.

By this mode of attaching the body to the rod *d*, the quick adjustment by rack and pinion, and the slow adjustment by screw and lever, are both brought within the smallest compass, and occasion no extra bulk to the microscope.

The body 1, 1, may be lengthened by pulling up the inner tube 13, the eye-piece screws into it, and the eye-lens is so placed that its distance from the field-lens may be accurately adjusted to suit any length of body, which I fully explained in my paper on eye-pieces, Vol. LI. of the Society's Transactions.

Drawing Microscope.

When magnified images are to be traced on paper, the microscope is placed horizontally, as in plate 3; and instead of the ordinary eye-tube an adapter 13 is put in, this holds a graphic eye-piece 14 (described in Vol. L.); to support this additional weight the rod *d* is drawn out enough to hold the support 15. The diagonal eye-speculum will cause the rays of light to be directed up to the eye, as 16, 16, the eye receiving which looks in the direction 17, 17, towards the paper lying on the table, and the image appearing to be thereon may be traced.

The stool is used for raising the microscope enough to place the eye-piece eighteen inches above the table, and which also serves to hold the lamp, or any other requisite quite clear of the table. A hook, with screw-nut, is passed through the stool to take hold of the foot, and secure it as shewn by dotted lines.

Phial Microscope.

This horizontal position of the microscope is also the best for viewing objects contained in phials, as they are less liable to be shaken from the sides when the phial is kept in a vertical position. Under 18 is seen a stud projecting downwards, with a notch in it, on this is to be put the blade 19 of the phial-holder, fig. 2, and the latch, or wedge, 20, will lock it fast. Fig. 3 is a better view of the blade and wedge; the bed 21 is lined with cloth, against which is placed the phial and the cover 22, also lined, which will hold it fast, being pressed by the spring 23. The pin 24 standing in a gap, allows the cover to slide to and fro, to suit different phials, and supports it on that side; the pin 23, passing through two parts of the cover, acts both as a guide and as a support. 25 is the aperture, at the front of which the object-glass is placed, and exactly opposite to which the dark-chamber 26 is screwed in. When the phial-holder is fixed to the microscope, its aperture 25 stands a little lower than the rod *d*, and exactly at the same distance from it as the axis of the microscope, so that the body when brought round coincides with it; the mirror, in order to coincide with it, is turned round also. A wooden prop, shewn by dotted lines, extends from the stool to the arm 15, it tends to steady the microscope, and secures it in its horizontal position.

The condensing lens 27, plate 2, is most conveniently held by the movable arm, the curve 29 and joint 30 allow it to be moved to or from the stage, either vertically or horizontally, so as to suit every purpose.

The pillar of the microscope turns on the foot, the longer toes of which can thus be brought under the superincumbent weight; thus a smaller foot than usual is rendered sufficient for its purpose. The shape of the foot is somewhat like that of a bird's, and is shewn by fig. 14, plate 1; it is strictly triangular, and the two long toes are at right aagles to each other, and thus the length of the short toe is readily determined. It is cast hollow, and from its particular form is rendered very stiff.

CORNELIUS VARLEY.

No. V.

ANNULAR SCUPPER-MOUTH FOR SHIPS' DECKS.

The SILVER ISIS MEDAL was presented to Commander H. DOWNES, R.N., of Ladbroke Terrace, Notting Hill, for his Annular Scupper-mouth for Ships' Decks.

THE improved scupper-mouth originated in 1831, from Commander Downes having seen a frigate's main deck